

The Impact of a Patient Safety Program on Medical Error Reporting

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Abstract

Background: In response to the occurrence of a sentinel event—a medical error with serious consequences—Eglin U.S. Air Force (USAF) Regional Hospital developed and implemented a patient safety program called Medical Team Management (MTM) that was modeled on the aviation industry’s Crew Resource Management program and focused on communication, teamwork, and reporting.

Objective: To determine the impact of a patient safety program on patterns of medical error reporting. **Methods:** This study was a retrospective review of 1,102 incident reports filed at Eglin USAF Regional Hospital in Florida between 1997 and 2001. Collected data from the comparison periods (1998 and 2001) was statistically analyzed using the chi-square test. **Results:** The number of reports submitted increased significantly from 200 for 4,671 hospital admissions in 1998 to 276 for 4,003 admissions in 2001 (chi-squared = 28.38, $P < 0.0001$).

Evaluation of incident severity showed 172 (86 percent) near misses (no impact on patient) in 1998 and 251 (91 percent) in 2001. In 1998 there were 28 (14 percent) adverse events (patient minimally effected) and 25 (9 percent) in 2001 (chi-squared = 3.302, $P = 0.069$). Analysis by rank of person filing the report revealed 39 reports submitted by junior nurses and 11 submitted by junior enlisted personnel in 1998, while in 2001 those numbers increased to 75 and 24 reports, respectively (chi-squared = 6.554, $P = 0.161$). **Conclusion:** This study indicates that, since the implementation of MTM, there has been a statistically significant increase in the number of reports filed at Eglin USAF Regional Hospital. Similarly, the severity of incidents shows an overall decline approaching statistical significance. Although there was an increase in reporting from junior team members, this was not statistically significant. These findings suggest that there have been changes in the patterns of error reporting since the implementation of MTM.

Introduction

The Hippocratic Oath, a foundation of medical practice, urges practitioners to “first, do no harm.” However, the 1999 Institute of Medicine (IOM) report, *To Err Is Human: Building a Safer Health System*¹ revealed that much harm is being done. This now often-cited report compiled statistics suggesting that as many as 98,000 people may be dying each year as a result of medical errors.

Medical facilities have long had systems in place to monitor errors. These systems, however, mostly consisted of the filing of incident reports once an error was discovered.^{2,3} This was, by design, a retrospective approach that often

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE MAY 2005		2. REPORT TYPE N/A		3. DATES COVERED -	
4. TITLE AND SUBTITLE The Impact of a Patient Safety Program on Medical Error Reporting				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Agency for Healthcare Research and Quality Office of Communications and Knowledge Transfer 540 Gaither Road, Suite 2000 Rockville, MD 20850				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release, distribution unlimited					
13. SUPPLEMENTARY NOTES Published in Advances in Patient Safety: From Research to Implementation. Volumes 1-4, AHRQ Publication Nos. 050021 (1-4). February 2005. Agency for Healthcare Research and Quality, Rockville, MD. http://www.ahrq.gov/qual/advances/.					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT UU	18. NUMBER OF PAGES 10	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

assigned blame to individuals and did little to analyze systems, identify trends, or make recommendations for overall improvements. With increasing media attention and public awareness of medical errors, it became clear that this system of monitoring was inadequate.

Patient safety has become a central focus for most medical institutions and many new programs to monitor safety and prevent medical mistakes have emerged as a result. The use of new technologies, the employment of automated systems, the introduction of system redundancies, the use of event simulation, and the implementation of new staff training are all strategies that have been put in place in an attempt to reduce the rate of errors.⁴⁻⁷

Like most hospitals, Eglin U.S. Air Force (USAF) Regional Hospital in Florida had been practicing reactive error monitoring. However, as the result of a sentinel event (a medical error resulting in an unanticipated death or injury) that coincided with the release of the IOM report, Eglin USAF Regional Hospital decided to reconsider this system. A working group was formed and tasked with developing a new strategy to identify and reduce medical errors. What resulted is a patient safety program known as Medical Team Management (MTM).

While changes to staff training have been a common response to the new focus on patient safety,^{8,9} MTM is unique in several respects. First, as an Air Force hospital closely associated with aviation, this program draws heavily from the lessons learned about human error and flight mishaps.¹⁰ The aviation industry developed a safety program known as Crew Resource Management that teaches fliers the principles of teamwork, communication, stress management, and other human factor principles to prevent aviation mishaps. Crew Resource Management also emphasizes the need for anonymous reporting of near misses and the removal of blame as a deterrent to the collection of accurate information.^{10,11} In addition to incorporating these principles, MTM is directed at all members of the medical team—physicians, nurses, medical technicians, and other hospital workers. As miscommunication has been identified as the leading cause of preventable medical errors,¹²⁻¹⁴ MTM focuses primarily on facilitating clearer communication within and between these groups to create a safer patient care environment.¹⁵

While course evaluations of MTM have been overwhelmingly positive,¹⁵ a quantitative look at this training's impact on communication, reporting, or severity of medical errors had not been undertaken. Because the chain of events that results in a bad patient outcome is so complex, it is difficult to analyze medical errors.^{1,5} However, one method of measuring the initial impact of MTM is to examine patterns of error reporting. As a routine component of continuous quality improvement (CQI), most medical facilities track errors and incidents. Of all practice locations, the inpatient, nonintensive care unit setting is a high-volume area with rapid turnover of patients and minimal staffing where the risk for serious medical errors is high.¹⁶

This study hypothesizes that, by focusing on improved communication and the removal of blame from reporting mistakes, the initiation of MTM training will result in an increase in error reporting. As a result of a larger volume and

improved information made available by increased reporting, it is subsequently believed that the severity of incidents will decline and that bad patient outcomes will be averted. It is the aim of this paper to evaluate the success of MTM by comparing rates of error reporting and types of errors reported prior to and since the program's implementation. It will also examine which members of the health care team are filing reports, hypothesizing that a curriculum that emphasizes communication and empowerment of even the most junior team members might result in an increase in reporting from lower-ranking nurses and medical technicians. Finally, by comparing the rates of reporting at Eglin USAF Regional Hospital to that of other military medical facilities not exposed to MTM training, the impact of this program will be demonstrated.

Although a direct cause-and-effect relationship may be impossible to establish, finding significant differences in reporting rates will strongly suggest that MTM was at least one important factor in changing Eglin USAF Regional Hospital's approach to patient safety.

Methods

This study is a retrospective review of routinely filed incident reports. As per hospital operating instruction, staff members are required to file an incident report on SGQ Form 1 to record any deviations from the expected plan of care. At Eglin Regional USAF Regional Hospital, these error-tracking reports are processed by the Quality Office (formerly known as the Risk Management Office), and each is categorized as a *near miss*, an *adverse event*, or a *sentinel event*. A near miss is a mistake that is caught and corrected before it ever reaches the patient. An adverse event has minimal effect on the involved patient and does not result in any significant or permanent disability. A sentinel event, however, is a major occurrence resulting in an unexpected death or permanent disability. Most sentinel events are reportable and require further investigation via a formal root cause analysis. The total number of reports received is also used as a surrogate for rate of errors per hospital admission. The Quality Office at Eglin USAF Regional Hospital is staffed primarily by civilian contract employees and had little turnover during the period of time covered by this study. All incident reports included in this study were reviewed in an aggregate form with no associated patient identifying information.

For this study, 1,102 incident reports filed by the Multi-Service Inpatient Unit between 1997 and 2001 were reviewed. The Multi-Service Inpatient Unit provides care for all medical, surgical, and pediatric inpatients. It is staffed by a combination of active duty Air Force and civilian contract nurses and medical technicians. It has an average daily census of 26 patients and an average length of stay of 48 hours.

A historical review for confounding factors revealed that a computer system upgrade, occurring in 1997, changed the way report data was processed. MTM training commenced in 1999. Initially, all personnel assigned to the medical group received the training in scheduled, large group sessions. Subsequently, the

training was directed at all new hospital and clinic employees as an ongoing effort with sessions offered every other month. By the end of 2001, over 750 medical group employees, approximately 91 percent of all assigned personnel, had been trained.¹⁵ Given this, it was determined to compare data from incident reports filed in 1998 to that collected in 2001. As a point of comparison, 2001 data on number and severity of reports filed from all medical facilities in the Air Force Materiel Command (AFMC) was obtained. These medical facilities are grouped together solely by the primary mission of the Air Force Base where they are located. Data from the AFMC was only made available in an aggregate form calculated per 100 hospital admissions. Although useful comparison information, its significance is diluted because Eglin USAF Regional Hospital is a part of the Air Force Materiel Command and its statistics are also included within this dataset.

Data pertaining to the total number of reports, the assigned incident category and severity, and the military rank/job title of the person filing the report was entered for statistical analysis. SPSS software (SPSS, Inc., Chicago, IL) was used to analyze the data and the Pearson chi-square test was used to compare different datasets.¹⁷

Results

Using data collected from routinely filed incident reports from the Multi-Service Inpatient Unit, the total number of reports filed, the severity of incidents reported, and the military rank/job title of the person submitting the report in 1998 were compared to the same parameters from 2001. The total number of reports submitted increased significantly from 200 for 4,671 hospital admissions in 1998 to 276 for 4,003 hospital admissions in 2001 ($P < 0.0001$). That is a rate of 6.89 reports per 100 hospital admissions in 2001 compared to 4.28 per 100 hospital admissions in 1998 (Figure 1).

Evaluation of the severity of incidents reported showed 172 near misses (no impact on patient) among 200 total reports filed in 1998, compared to 251 among 276 in 2001. In 1998 there were 28 adverse events (patient minimally effected) among 200 reports, and 25 among 276 in 2001 ($P = 0.069$; Figure 2). Standardized per 100 reports filed, that gives a rate of 90.94 near misses and 9.06 adverse events in 2001, compared with a rate of 86.00 near misses and 14.00 adverse events in 1998 (Table 1).

Analysis by military rank/job title of the person filing the incident report revealed 39 of 200 reports were filed by lieutenants (junior nurses) and another 11 of the 200 were filed by junior enlisted personnel (junior medical technicians) in 1998, while in 2001 those numbers increased to 75 of 276 and 24 of 276, respectively ($P = 0.161$; Figure 3). Although absolute reporting increased for team members of all military ranks/job titles from 1998 to 2001, as a percentage of all reports filed, only lieutenants (junior nurses) and junior enlisted members (junior medical technicians) showed an increase. Reports filed by lieutenants increased from 19.5 percent to 27.2 percent of all reports filed, and from 5.5 percent to 8.7

percent for junior enlisted members, although these increases were not statistically significant.

Figure 1. Rate of incident reports filed per 100 hospital admissions in 1998 and 2001

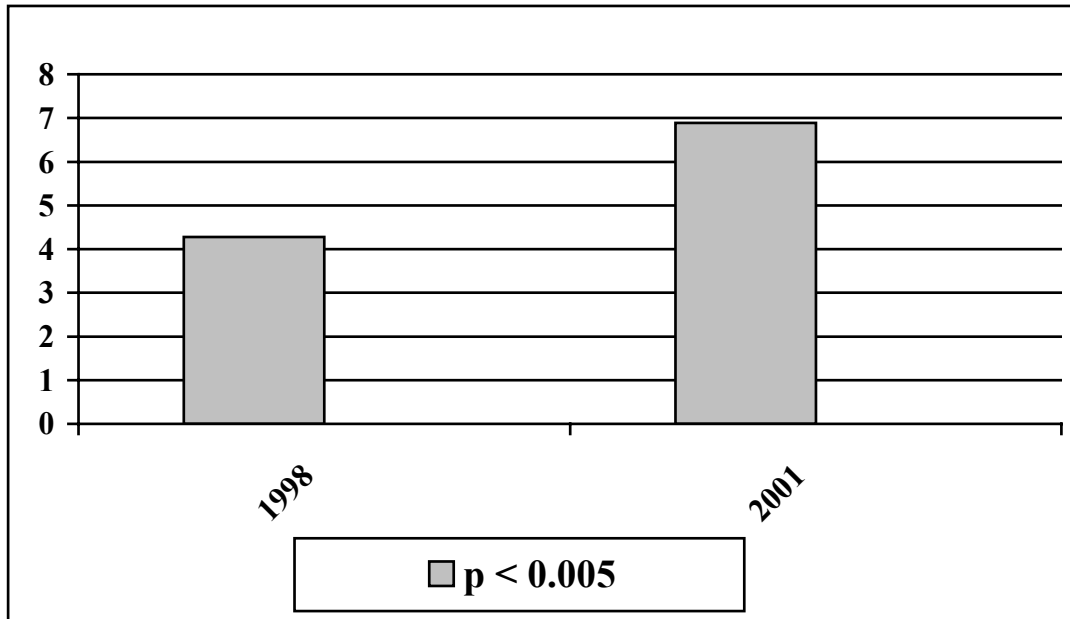


Figure 2. Total number of incident reports and number categorized as “near miss,” “adverse event,” or “sentinel event” in 1998 and 2001; $P = 0.069$

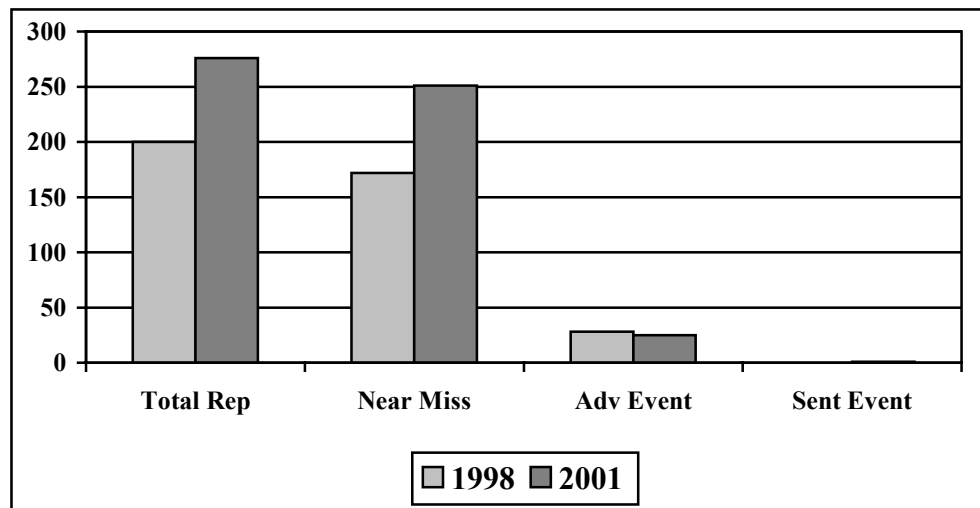


Table 1. Rate of near misses and adverse events per 100 incident reports filed in 1998 and 2001; $P = 0.061$

Incident type	1998	2001
Near misses	86.00	90.94
Adverse events	14.00	9.06

Figure 3. Number of personnel filing incident reports in 1998 and 2001, sorted by military rank; $P = 0.161$

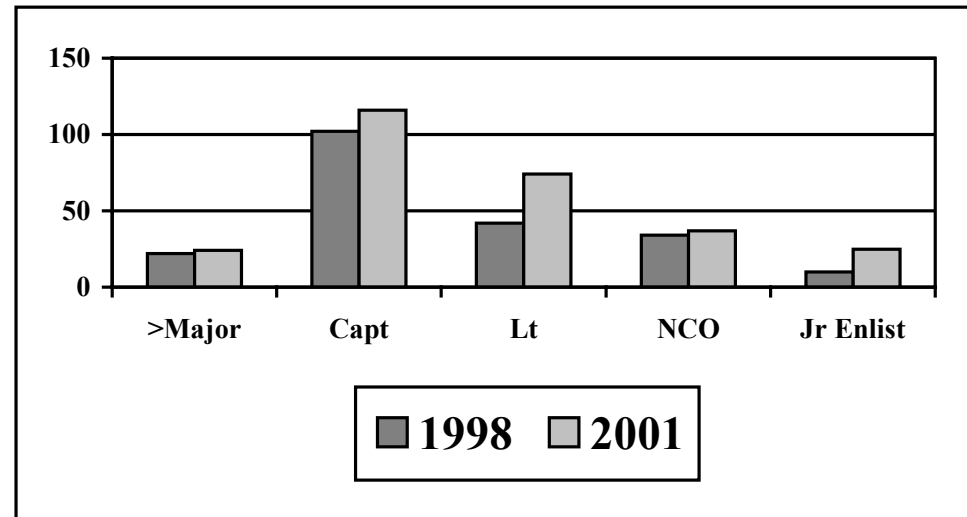


Table 2. Comparison of reporting rates and incident severity per 100 hospital admissions at Eglin U.S. Air Force Regional Hospital and all medical facilities in AFMC; $P = 0.068$

	Eglin	All AFMC
Total Reports	6.89	5.07
Near Misses	6.27	4.43
Adverse Events	0.62	0.69

The 2001 data on numbers and severity of incident reports collected at Eglin USAF Regional Hospital was compared to the same data collected from all of the medical facilities in the AFMC. Per 100 hospital admissions, there were 6.89 incident reports filed with 6.27 near misses and 0.62 adverse events at Eglin USAF Regional Hospital, compared to 5.07 reports, 4.43 near misses, and 0.65 adverse events for all of AFMC ($P = 0.067$; Table 2).

Discussion

Aviation's Crew Resource Management is one of industry's safety gold standards. Its focus on attitude and leadership, team training, skill enhancement

with simulation, and reporting changed the culture of aviation.^{7, 10, 11} Given that aviation and health care share many common characteristics, including high-stakes, complex environments, a team setting, and personnel with similar personality traits,^{10, 11} the concepts of Crew Resource Management are well suited to application in the health care setting. Medical Team Management has incorporated many of the lessons learned from Crew Resource Management. The MTM curriculum emphasizes seven Critical Success Elements:¹⁵

- Daily Operating Strategy,
- Situational Awareness,
- Workload Performance,
- Available Resources,
- Policies and Regulations,
- Command Authority, and
- Medical Team Communication.

These concepts are taught during a 4-hour session of lecture, role-playing, interactive situational analysis, and video presentations. In addition, MTM is unique in its focus on the entire medical team. Training has been mandated for all personnel and is included as part of required orientation for all new arrivals to the medical group—housekeeper to medical records administrator, nurse manager to senior physician.

As the breakdown in communication has been implicated as the single leading factor in medical mistakes,^{12–14} MTM's primary focus is on improving team interactions and clarity of communication. Given the multiple hierarchies that impact the medical team, particularly in the military setting, empowering team members to speak up and, sometimes, question the plan of care has involved a culture change. Teamwork training has not, traditionally, been a part of medical education, and as a result, there are many barriers to clear communication between the various contributors to the care of a patient.^{18, 19} MTM teaches communication by discussing verbal and nonverbal cues and listening skills.¹⁵ These concepts are implemented through several exercises and role-playing activities that encourage increased involvement from more junior members of the team.

In addition to ongoing training for all medical group personnel, MTM has since evolved to further facilitate communication between members of specific care teams. This new component of the training has been directed at the high-risk areas of obstetrics, surgery, emergency medicine, and the intensive care unit; it involves eight small-group sessions with assigned teams or shifts. The sessions focus on identification of intra-team conflicts and team-building, as well as on mutually agreed-upon problem areas and solution proposals. This phase of the training had not yet been initiated at the time this study was completed.

Like Crew Resource Management, MTM also emphasizes the importance of incident reporting. Although this is not a new concept, its evolution into a nonpunitive tool is a dramatic change.^{20, 21} In the past, acknowledging mistakes has often meant taking blame. However, Crew Resource Management, as well as recommendations from the IOM, the Department of Defense, and the Federal Government's Quality Interagency Coordination Task Force, have all advocated the establishment of improved reporting systems as a way to learn from errors.^{1, 20} There are mandatory and voluntary reporting systems, each of which offers strengths at collecting certain types of data.²⁰ Mandatory reporting allows for the collection of standardized data and the identification of errors that could and should be prevented.^{1, 20} It also facilitates the dissemination of important information to the public and holds health care organizations accountable for the safety of the care they provide. Voluntary reporting programs are usually anonymous and, as such, can often provide more candid information that ultimately leads to improved safety in processes and systems.²⁰⁻²² A number of large medical and nonmedical organizations have employed voluntary reporting systems to obtain improvements in their respective safety parameters.²⁰ Both mandatory and voluntary reporting systems have a role in the overall improvement in patient safety. The key to any reporting system however, is in the analysis and feedback of the information gathered in the reports.²⁰ The report analysis often includes a thorough probe of the root causes and contributing factors associated with the identified problem, and the feedback must present leaders empowered to make change with clear recommendations for the implementation of action-oriented outcomes.^{1, 20}

Conclusions

Medical mistakes are a serious problem for health care systems and the patients they treat.^{1, 16, 23} While medical facilities and health care providers at all levels strive to provide competent, compassionate, and safe care, they are not currently achieving this goal. Many approaches to improving safety have been initiated and many have focused on improved training. MTM is a U.S. Air Force patient safety program that is unique in its origins from aviation's Crew Resource Management and in its emphasis on communication, teamwork, and reporting. The program has been presented to all employees, whether involved in direct patient care or not, at Eglin USAF Regional Hospital, where the program originated. MTM has since been expanded to include other Air Force and Department of Defense medical facilities and has evolved into a phase of team-specific training in high-risk areas. This study suggests that changes have occurred in the patterns of medical error reporting at Eglin USAF Regional Hospital since MTM was initiated.

Medicine is practiced in a very complex environment.^{1, 10, 16, 23} The multidimensional process by which a medical mistake occurs is even more complex.^{1, 23} This complexity makes the analysis of errors and patterns of mistakes particularly difficult to analyze. The causes of mistakes are always multifactorial and therefore, by necessity, so are the remedies. In addition to

specific interventions, the media, general public awareness, and personal experiences all impact on changes in behavior. Because of this, a direct causal relationship between patient safety programs and changes in specific safety measures are difficult to establish.

This study, however, did demonstrate a statistically significant increase in medical error reporting after the implementation of the MTM training program. An increase in reporting is the first step and the key to gathering more information for analysis, the identification of trends, and, ultimately, recommendations for changes in the way health care is practiced. Similarly, this study also demonstrated a trend approaching statistical significance of an overall decline in the severity of the incidents reported. Support for the reality of this trend and changes in reporting that were independent of external influences is suggested by comparing the total number of filed incident reports and the severity of those reports at Eglin USAF Regional Hospital to other military health care facilities. Finally, while the study did show a percentage increase in the number of reports being filed by the most junior members of the health care team, this finding was not statistically significant.

Although these changes in the patterns of medical error reporting at Eglin USAF Regional Hospital are undoubtedly the result of many influences, the implementation of the Medical Team Management training program appears to be one significant factor.

Acknowledgments

I would like to acknowledge the 96th Medical Operations Squadron, 96th Medical Group, Eglin Air Force Base, FL, for providing funding for the completion of a Faculty Development Fellowship in Family Medicine at the University of North Carolina at Chapel Hill, during which this research was completed. I would also like to acknowledge mentors and colleagues at the University of North Carolina and at the Quality Office at the 96th Medical Group who facilitated the completion of this project.

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